

# **Assignment Sheet / Density Test**

Project Number: 23502-ZS9Lab. Tech: K. FordProject Name: HSRDate Completed: 11/26/13Date Drilled: 10/25/13Boring: \$0069AR

Sample	Depth	Tests	Soil Wt Gms	Length in	Diameter in	Wet Wt Gms	Dry Wt Gms	Wet Density	Moisture %	Dry Density	Soil Classification
		PI,EI,CURV,RV,RV	•			<b>U</b>	<b>U</b>	20.ioity	,,	Demony	0.00000
B01	0-5'	T,CBR									CL
MC02-2	5.5-6'	DD	852.8	5.90	2.42	200	173.1	119.8	15.5%	103.6	CL/SP
MC02-1	6-6.5'	SA				200	169.7		17.9%		CL/SM
MC04-1	16-16.5'	DS	122.5	1.02	2.42	200	190.9	99.5	4.8%	95.0	SP
SS05	21-21.5'	PI,DD				52	44.4		16.9%		SM/CL
MC06-1	26-26.5'	TRX									CL
U08	32-34.5'	DD,HY,SA,DS	158.6	1.02	2.42	180	153.4	128.8	17.3%	109.8	SM
MC09-1	36-36.5'	TRX									
SS10	41-41.5'	HY,SA									SM
MC12-1	46-46.5'	DS	152.9	1.02	2.42	200	165.4	124.2	20.9%	102.7	CL
MC14-1	56-56.5'	SA,DS	165.8	1.02	2.42	200	174.9	134.7	14.4%	117.8	SM
SS15	61-61.5'	PI									SM
SS17	71-71.5'	PI,DD				200	164.7		21.4%		SM
		,									_
					1						
					1						

### Notes:

CHEM Sulfate/Chloride MR Minimum Resistivity
COLL Collapse PH pH Test

COLL Collapse PH pH Test
CONSOL 1D Consolidation PI Atterberg Limits

CURV Modified Proctor RV R-value

DD Moisture Density RVT R-value Treated
DS Direct Shear SA Sieve Analysis
HY Hydrometer TRX Triaxial Compression

#### **MOISTURE & DENSITY TEST** ISI Lab No.: G-52923 Client: URS/ARUP/HMM JV Project: California High Speed Train Job no: 2636-001.0 S0029R S0030R S0033AR S0069AR S0069AR S0069R Boring # S0029R S0069AR Sample # MC09-2 U10 MC10-3 SS16 U11 MC16-1 MC18-1 MC02-2 42.0-44.5 5.5-6.0 Depth (ft.) 41.0-41.5 42.0-44.5 42.0-42.5 50.0-51.5 65.0-66.5 75.0-76.5 Grayish brown Olive brown sandy Greenish gray Grayish brown silt Olive brown sandy Olive gray sandy Olive brown silty Grayish green Soil type: (visual) with sand clay with sand silty clay silt clayey sand clay clay (BAGGIE COULD NOT DO MD) 01/15/14 01/17/14 1. Date tested: 01/17/14 01/17/14 01/17/14 01/17/14 01/17/14 01/17/14 1. 2. Tested by: JΗ JΗ JH JΗ JΗ JH JΗ JΗ 3. Specimen height (in.) 5.96 3.93 3.96 6.00 6.00 5.95 3. 5.90 4. Wt. of specimen + tare (gm) 900.72 868.95 815.58 880.48 951.22 956.29 897.34 4. 5. Tare wt. (gm) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 5. 6. Diameter (in.) 2.41 2.85 2.37 2.87 2.42 2.42 2.41 7. Wet wt. of soil + dish wt. (gm) 276.47 264.91 298.04 98.44 273.64 275.82 301.24 293.74 8. Dry wt. of soil + dish wt. (gm) 229.46 229.54 247.22 90.20 239.02 239.79 257.94 255.15 8. 9. Wt. of dish (gm) 50.59 50.41 50.06 50.96 51.20 50.87 50.41 50.89 9. 10.

Wet Density ( pcf )	126.1	131.9	119.3		130.8	131.2	131.9	125.8
Dry Density ( pcf )	99.9	110.2	94.8		110.5	110.2	109.1	105.8
Moisture Content (%)	26.3	19.7	25.8	21.0	18.4	19.1	20.9	18.9
Gs (Assumed)	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70
Void Ratio	0.687	0.529	0.777		0.525	0.529	0.544	0.592
Saturation ( % )	103.3	100.7	89.6		94.8	97.3	103.6	86.2

#### Additional data:

10. Dish ID

vvt. of ary soil + alsh before				
washing ( gm )				
Wt. of dry soil + dish after				
washing ( gm )				
% Passing # 200 sieve				
USCS symbol				



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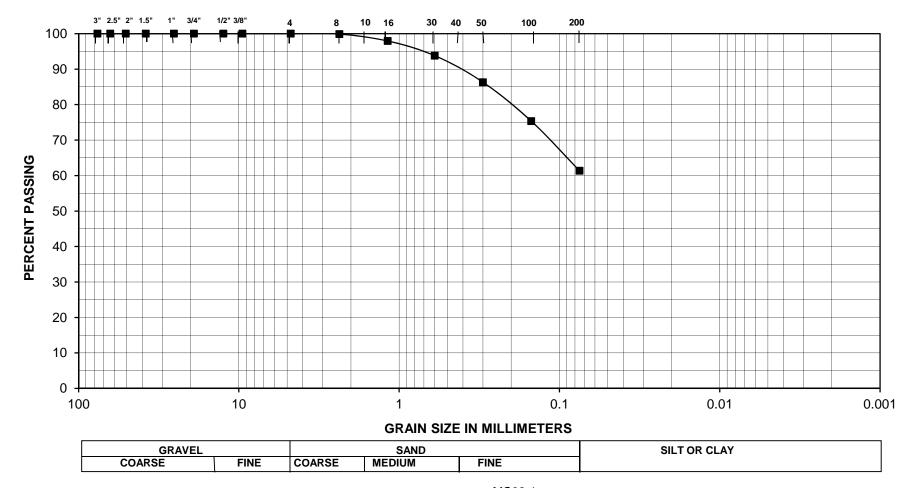
## Sieve Analysis for Soil / Fine Aggregate ASTM C-136

Project:	CA HSR		Technician:	K. Ford			
			Date:	11/19/2013			
TES#:	23502-ZS9		Sample No.:	MC02-1			
Boring #:	S0069AR; 6-6.5'		Classification:	(ML) Sandy Silt			
	•						
		Weight	Maximum	Minimum Weight of			
		(lbs. or grams)	Sieve Size	Test Specimen, lbs. (kg)			
Total Dry S	Sample + Tare Wt.		Sand	1.0 (0.5)			
Tare Weig	ıht		3/8"	2.0 (1.0)			
Total Dry S	Sample Wt.	169.7	1/2"	4.0 (2.0)			
Initial Wei	ght Fine		3/4"	11.0 (5.0)			
Aggregate	Before Wash	169.7	1"	22.0 (10.0)			
Final Weig	ght Fine		1 1/2"	33.0 (15.0)			
Aggregate	After Wash	66.7	2"	44.0 (20.0)			
	Cumulativa	Individual	Cumulativo	Cumulativa			

	Cumulative	Individual	Cumulative	Cumulative	
Sieve	Weight	Weights	%	%	
Size	Retained	Retained	Retained	Passing	Specs.
3 in.			0.0	100.0	
2 1/2 in.			0.0	100.0	
2 in.			0.0	100.0	
1 1/2 in.			0.0	100.0	
1 in.			0.0	100.0	
3/4 in.			0.0	100.0	
1/2 in.			0.0	100.0	
3/8 in.			0.0	100.0	
#4	0.0	0.0	0.0	100.0	
#8	0.2	0.2	0.1	99.9	
#16	3.5	3.3	2.1	97.9	
#30	10.5	7.0	6.2	93.8	
#50	23.2	12.7	13.7	86.3	
#100	41.8	18.6	24.6	75.4	
#200	65.6	23.8	38.7	61.3	
Pan	66.7				

### U.S. STANDARD SIEVE OPENING IN INCHES

#### **U.S. STANDARD SIEVE NUMBERS**



—**■**— MC02-1

Sample #	Classification	% Gravel	% Sand	% Silt	% Clay	% Moist.	LL	PL	PI	Project:	CA HSR
MC02-1	(ML) Sandy Silt	0	38.7	61.3							
										TES#:	23502-ZS9
										Boring #	S0069AR; 6-6.5'
										Date:	11/19/2013



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# Sieve Analysis for Soil and Fine Aggregate

 Project:
 CA HSR FRE\_BAK
 Technician:
 K. Ford

 TES#:
 23502-ZS9
 Date:
 11/5/2013

 Boring No.:
 S0069AR
 Depth, ft
 32.5-33'

 Sample No.:
 U08
 Classification:
 (ML) Clayey Sandy Silt

	Weight (grams)	Maximum Sieve Size	Minimum Weight of Test Specimen, lbs. (kg)
Total Dry Sample + Tare Wt.	, σ	Sand	1.0 (0.5)
Tare Weight		3/8"	2.0 (1.0)
Total Dry Sample Wt.	73.8	1/2"	4.0 (2.0)
Initial Weight Fine		3/4"	11.0 (5.0)
Soil Before Wash	73.8	1"	22.0 (10.0)
Final Weight Fine		1 1/2"	33.0 (15.0)
Soil After Wash	34.4	2"	44.0 (20.0)

	Individual	Individual	Combined	Combined	
Sieve	Weight	%	%	%	
Size	Retained	Retained	Retained	Passing	Specs.
3 in.	0.0	0.0	0.0	100.0	
2 1/2 in.	0.0	0.0	0.0	100.0	
2 in.	0.0	0.0	0.0	100.0	
1 1/2 in.	0.0	0.0	0.0	100.0	
1 in.	0.0	0.0	0.0	100.0	
3/4 in.	0.0	0.0	0.0	100.0	
1/2 in.	0.0	0.0	0.0	100.0	
3/8 in.	0.0	0.0	0.0	100.0	
#4	0.0	0.0	0.0	100.0	
#8	0.0	0.0	0.0	100.0	
#10	0.1	0.1	0.1	99.9	
#16	0.2	0.3	0.4	98.5	
#30	6.0	8.1	8.5	91.5	
#40	3.5	4.7	13.3	86.7	
#50	4.2	5.7	19.0	81.1	
#100	7.2	9.8	28.7	71.3	
#200	11.4	15.4	44.1	55.9	
Pan					



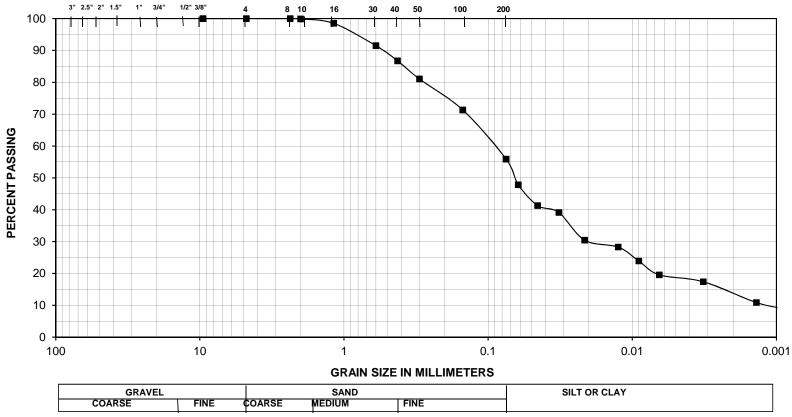
### **HYDROMETER TEST DATA SUMMARY ASTM D 422-63**

PROJECT:	_	CA HSR F	RE_BAK			TES # :	S0069AR
Boring Number		S006	9AR			DATE:	11/5/2013
Sample Depth	, ft	32.5	32.5-33'		U08	TESTED BY:	K. Ford
Mass of Test	Sample. a		75.00	"air-dried"	7	Hydrometer Type	151H
	scopic Sample, g		22.69	"air-dried"	1	,	
	scopic Sample, g		22.34	"oven-dried"	Specific Gravity of Test Material		2.650
Mass of Test S			73.84	"oven-dried"	Specific Gravity of Test Solution		Varies
Time	Hydrometer	Corrected	Temperature	Effective Depth	Constant, K	Diameter, D	Amt. Suspended, P
(min.)	Reading	Reading	Degrees C	Table 2 (cm)	Table 3	(mm)	(%)
0.5	1.024	1.022	21	10.5	0.01348	0.0618	47.9
1	1.021	1.019	21	11.3	0.01348	0.0453	41.4
2	1.020	1.018	21	11.5	0.01348	0.0323	39.2
5	1.016	1.014	21	12.6	0.01348	0.0214	30.5
15	1.015	1.013	21	12.9	0.01348	0.0125	28.3
30	1.013	1.011	21	13.4	0.01348	0.0090	24.0
60	1.011	1.009	21	13.9	0.01348	0.0065	19.6
250	1.010	1.008	21	14.2	0.01348	0.0032	17.4
1440	1.007	1.005	21	15.0	0.01348	0.0014	10.9
4140	1.006	1.004	21	15.2	0.01348	0.0008	8.7
				1	1		



#### U.S. STANDARD SIEVE OPENING IN INCHES

#### **U.S. STANDARD SIEVE NUMBERS**



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Sample #	Classification	% Gravel	% Sand	% Silt	% Clay*	% Moist.	LL	PL	PI	Project:	CA HSR FRE_BAK
32.5-33'	(ML) Clayey Sandy Silt	0	44.1	36.5	19.4	1.6					
										TES#:	S0069AR
										Boring#:	U08
										Date:	11/5/2013

<sup>\*</sup> Particles smaller than 5 Micron in diameter



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# Sieve Analysis for Soil and Fine Aggregate

 Project:
 CA HSR FRE\_BAK
 Technician:
 K. Ford

 TES#:
 23502-ZS9
 Date:
 11/5/2013

 Boring No.:
 S0069AR
 Depth, ft
 41-41.5'

 Sample No.:
 SS10
 Classification:
 (ML) Clayey Sandy Silt

	Weight (grams)	Maximum Sieve Size	Minimum Weight of Test Specimen, lbs. (kg)
Total Dry Sample + Tare Wt.	, σ	Sand	1.0 (0.5)
Tare Weight		3/8"	2.0 (1.0)
Total Dry Sample Wt.	73.9	1/2"	4.0 (2.0)
Initial Weight Fine		3/4"	11.0 (5.0)
Soil Before Wash	73.9	1"	22.0 (10.0)
Final Weight Fine		1 1/2"	33.0 (15.0)
Soil After Wash	33.3	2"	44.0 (20.0)

	Individual	Individual	Combined	Combined	
Sieve	Weight	%	%	%	
Size	Retained	Retained	Retained	Passing	Specs.
3 in.	0.0	0.0	0.0	100.0	
2 1/2 in.	0.0	0.0	0.0	100.0	
2 in.	0.0	0.0	0.0	100.0	
1 1/2 in.	0.0	0.0	0.0	100.0	
1 in.	0.0	0.0	0.0	100.0	
3/4 in.	0.0	0.0	0.0	100.0	
1/2 in.	0.0	0.0	0.0	100.0	
3/8 in.	0.0	0.0	0.0	100.0	
#4	0.0	0.0	0.0	100.0	
#8	0.1	0.1	0.1	99.9	
#10	0.0	0.0	0.1	99.9	
#16	0.2	0.3	0.4	99.5	
#30	1.9	2.6	3.0	97.0	
#40	2.1	2.8	5.8	94.2	
#50	3.5	4.7	10.6	89.5	
#100	8.8	11.9	22.5	77.6	
#200	12.7	17.2	39.7	60.4	
Pan					



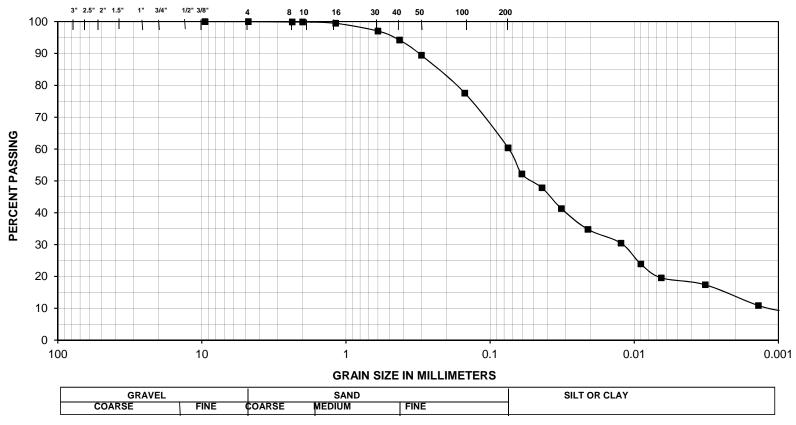
### **HYDROMETER TEST DATA SUMMARY ASTM D 422-63**

ple, g pic Sample, g	S006 41-4		_ Sample No.:	SS10	DATE: 1 TESTED BY: I	11/5/2013 K Ford
pic Sample, g	41-4		Sample No.:	SS10	TESTED BY: I	< Ford
pic Sample, g		75.00			_	
pic Sample, g		10.00	"air-dried"	1	Hydrometer Type	151H
		15.12	"air-dried"		,	
pic Sample, g		14.89	"oven-dried"	Specific Gravity o	f Test Material	2.650
ple, g		73.86	"oven-dried"			Varies
Hydrometer	Corrected	Temperature	Effective Depth	Constant, K	Diameter, D	Amt. Suspended, P
Reading	Reading	Degrees C	Table 2 (cm)	Table 3	(mm)	(%)
1.026	1.024	21	10.0	0.01348	0.0603	52.3
1.024	1.022	21	10.5	0.01348	0.0437	47.9
1.021	1.019	21	11.3	0.01348	0.0320	41.4
1.018	1.016	21	12.1	0.01348	0.0210	34.8
1.016	1.014	21	12.6	0.01348	0.0124	30.5
1.013	1.011	21	13.4	0.01348	0.0090	23.9
1.011	1.009	21	13.9	0.01348	0.0065	19.6
1.010	1.008	21	14.2	0.01348	0.0032	17.4
1.007	1.005	21	15.0	0.01348	0.0014	10.9
1.006	1.004	21	15.2	0.01348	0.0008	8.7
				+		
	Hydrometer Reading 1.026 1.024 1.021 1.018 1.016 1.013 1.011 1.010 1.007	Dic Sample, g           ple, g           Hydrometer         Corrected           Reading         Reading           1.026         1.024           1.021         1.019           1.018         1.016           1.016         1.014           1.013         1.011           1.011         1.009           1.010         1.008           1.007         1.005	Dic Sample, g     14.89       ple, g     73.86       Hydrometer Reading     Corrected Reading     Temperature Degrees C       1.026     1.024     21       1.024     1.022     21       1.021     1.019     21       1.018     1.016     21       1.016     1.014     21       1.013     1.011     21       1.011     1.009     21       1.010     1.008     21       1.007     1.005     21	Temperature   Fifective Depth   Reading   Reading   Possible   P	Temperature	Dic Sample, g



#### U.S. STANDARD SIEVE OPENING IN INCHES

#### U.S. STANDARD SIEVE NUMBERS



41-41.	
	41-41.

Sample #	Classification	% Gravel	% Sand	% Silt	% Clay*	% Moist.	LL	PL	PI	Project:	CA HSR FRE_BAK
41-41.5'	(ML) Clayey Sandy Silt	0	39.7	41.0	19.4	1.5					
										TES#:	S0069AR
										Boring#:	SS10
										Date:	11/5/2013

<sup>\*</sup> Particles smaller than 5 Micron in diameter



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## Sieve Analysis for Soil / Fine Aggregate ASTM C-136

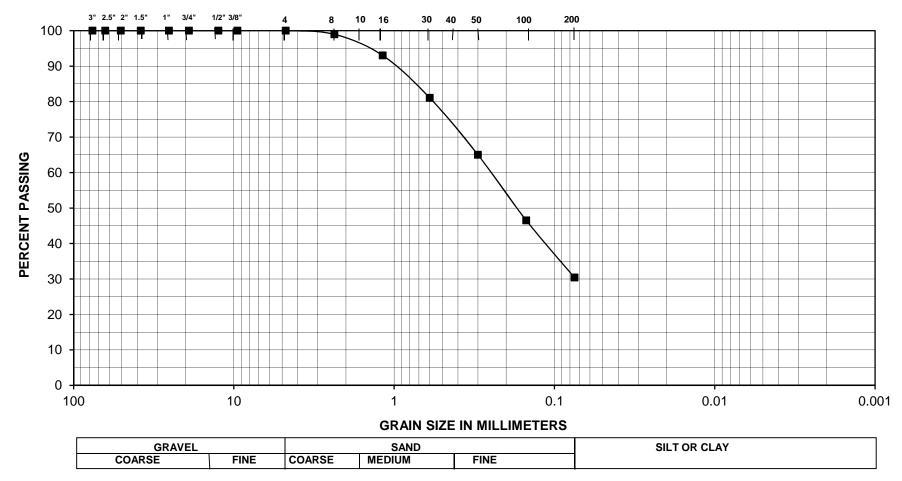
Project:	CA HSR		Technician:	K. Ford	
			Date:	11/19/2013	
TES#:	23502-ZS9		Sample No.:	MC14-1	
Boring #:	S0069AR; 56-56.	5'	Classification:	(SM) Silty Sand	
	•		-		
		Weight	Maximum	Minimum Weight of	
		(lbs. or grams)	Sieve Size	Test Specimen, lbs. (kg)	
Total Dry S	Sample + Tare Wt.		Sand	1.0 (0.5)	
Tare Wein	ht		3/8"	2 0 (1 0)	

	(lbs. or grams)	Sieve Size	Test Specimen, lbs. (kg)
Total Dry Sample + Tare Wt.		Sand	1.0 (0.5)
Tare Weight		3/8"	2.0 (1.0)
Total Dry Sample Wt.	174.9	1/2"	4.0 (2.0)
Initial Weight Fine		3/4"	11.0 (5.0)
Aggregate Before Wash	174.9	1"	22.0 (10.0)
Final Weight Fine		1 1/2"	33.0 (15.0)
Aggregate After Wash	122.8	2"	44.0 (20.0)

	Cumulative	Individual	Cumulative	Cumulative	
Sieve	Weight	Weights	%	%	
Size	Retained	Retained	Retained	Passing	Specs.
3 in.			0.0	100.0	
2 1/2 in.			0.0	100.0	
2 in.			0.0	100.0	
1 1/2 in.			0.0	100.0	
1 in.			0.0	100.0	
3/4 in.			0.0	100.0	
1/2 in.			0.0	100.0	
3/8 in.			0.0	100.0	
#4	0.0	0.0	0.0	100.0	
#8	1.8	1.8	1.0	99.0	
#16	12.2	10.4	7.0	93.0	
#30	33.1	20.9	18.9	81.1	
#50	61.2	28.1	35.0	65.0	
#100	93.5	32.3	53.5	46.5	
#200	121.7	28.2	69.6	30.4	
Pan	122.8				

### U.S. STANDARD SIEVE OPENING IN INCHES

#### **U.S. STANDARD SIEVE NUMBERS**



—**■**— MC14-1

Sample #	Classification	% Gravel	% Sand	% Silt	% Clay	% Moist.	LL	PL	PI	Project:	CA HSR
MC14-1	(SM) Silty Sand	0	69.6	30.4							
										TES#:	23502-ZS9
										Boring #	S0069AR; 56-56.5'
										Date:	11/19/2013



# Determination of Atterberg Limits ASTM D 4318, CTM 204

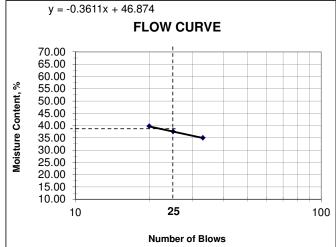
Project Name:	HSR	Boring No	o.: S0069A	.R	Project No.: 23502-ZS9					
Sample No:	B01	Depth:	0-5'	Date:	11/14/13	Tested By: K.F				
Soil Classification:	CL									

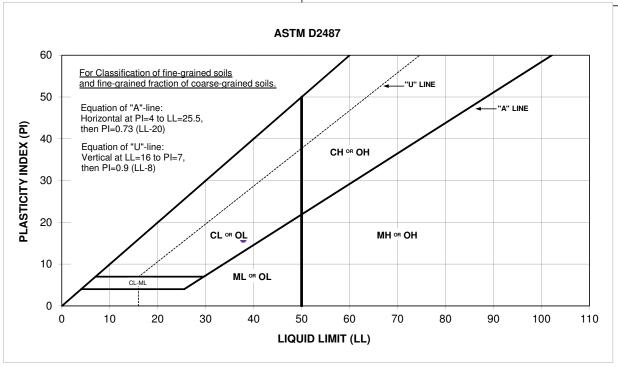
		PLASTIC LIMIT	-		LIQUID LIMIT				
A Tes No.	1	2	3	No. of Blows	33	25	20		
B Tare No.	1	2	3		1	2	3		
C Mass of Pan + Dry Soil, g	29.47	29.31	29.94		24.51	30.73	30.82		
D Mass of Pan + Wet Soil, g	29.72	29.50	30.40		25.82	31.60	31.83		
E Mass of Pan, g	28.25	28.41	28.04		20.77	28.42	28.28		
F Mass of Water, g	0.25	0.19	0.46	0.00	1.31	0.87	1.01		
G Mass of Dry Soil, g	1.22	0.90	1.90		3.74	2.31	2.54		
H Moisture Content, %	20.49	21.11	24.21		35.03	37.66	39.76		

I Average Moisture Content, % (PL)

21.94 42.1795

Liquid Limit:	37.8
Plastic Limit: Line I	21.9
Plasticity Index: Pl = LL - PL	15.9







# Determination of Atterberg Limits ASTM D 4318, CTM 204

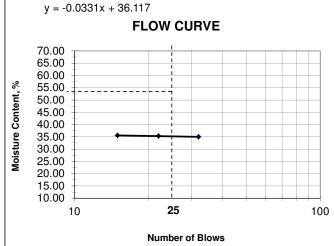
Project Name:	HSR	Boring No	o.: S0069AR			Project No.: 23502-ZS9	
Sample No:	SS05	Depth:	21-21.5'	Date:	11/20/13	Tested By: R.L.	
Soil Classification:	CL						

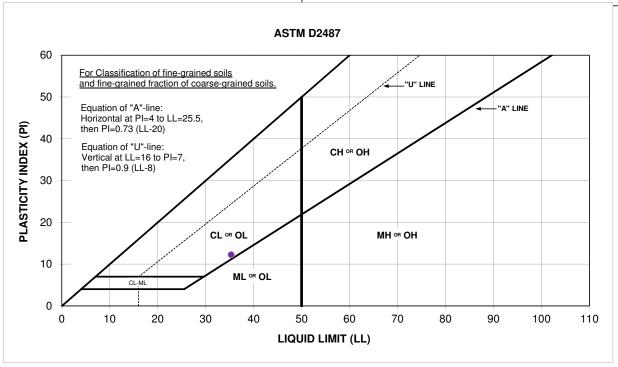
	F	PLASTIC LIMIT			LIQUID LIMIT				
Tes No.	1	2	3	No. of Blows	32	15	22		
Tare No.	1	2	3		1	2	3		
Mass of Pan + Dry Soil, g	28.80	29.10	29.70		36.10	29.50	29.10		
Mass of Pan + Wet Soil, g	28.90	29.30	30.00		38.80	32.60	32.00		
Mass of Pan, g	28.10	28.50	28.30		28.40	20.80	20.90		
Mass of Water, g	0.10	0.20	0.30	0.00	2.70	3.10	2.90		
Mass of Dry Soil, g	0.70	0.60	1.40		7.70	8.70	8.20		
Moisture Content, %	14.29	33.33	21.43		35.06	35.63	35.37		
	Fare No.  Mass of Pan + Dry Soil, g  Mass of Pan + Wet Soil, g  Mass of Pan, g  Mass of Water, g  Mass of Dry Soil, g	Tes No. 1  Fare No. 1  Mass of Pan + Dry Soil, g 28.80  Mass of Pan + Wet Soil, g 28.90  Mass of Pan, g 28.10  Mass of Water, g 0.10  Mass of Dry Soil, g 0.70	Tes No.         1         2           Fare No.         1         2           Mass of Pan + Dry Soil, g         28.80         29.10           Mass of Pan + Wet Soil, g         28.90         29.30           Mass of Pan, g         28.10         28.50           Mass of Water, g         0.10         0.20           Mass of Dry Soil, g         0.70         0.60	fare No.         1         2         3           Mass of Pan + Dry Soil, g         28.80         29.10         29.70           Mass of Pan + Wet Soil, g         28.90         29.30         30.00           Mass of Pan, g         28.10         28.50         28.30           Mass of Water, g         0.10         0.20         0.30           Mass of Dry Soil, g         0.70         0.60         1.40	Tes No.         1         2         3         No. of Blows           Fare No.         1         2         3           Mass of Pan + Dry Soil, g         28.80         29.10         29.70           Mass of Pan + Wet Soil, g         28.90         29.30         30.00           Mass of Pan, g         28.10         28.50         28.30           Mass of Water, g         0.10         0.20         0.30         0.00           Mass of Dry Soil, g         0.70         0.60         1.40	Tes No. 1 2 3 No. of Blows 32  Fare No. 1 2 3 1  Mass of Pan + Dry Soil, g  Mass of Pan + Wet Soil, g  Mass of Pan, g  Mass of Water, g  Mass of Dry Soil, g  0.70 0.60 1.40 7.70	Tes No. 1 2 3 No. of Blows 32 15  Fare No. 1 2 3 1 2  Mass of Pan + Dry Soil, g  Mass of Pan + Wet Soil, g  Mass of Pan, g  Mass of Pan, g  Mass of Water, g  Mass of Dry Soil, g  0.70 0.60 1.40 7.70 8.70	Tes No. 1 2 3 No. of Blows 32 15 22  Tare No. 1 2 3 No. of Blows 1 2 3  Mass of Pan + Dry Soil, g  Mass of Pan + Wet Soil, g  Mass of Pan, g  Mass of Pan, g  Mass of Oran, g  M	

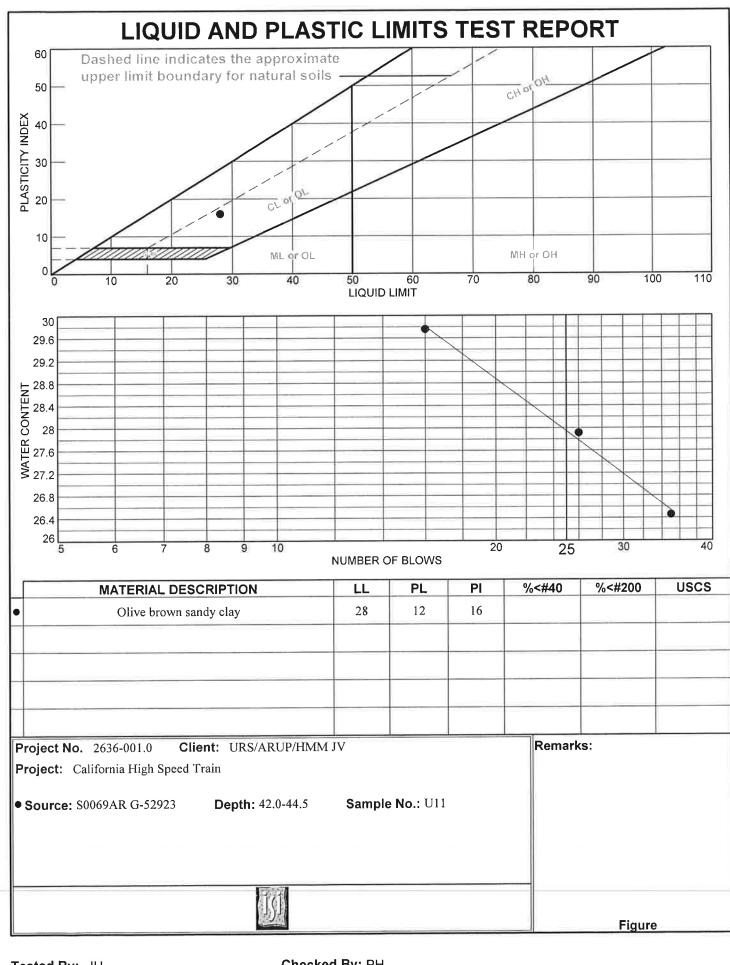
I Average Moisture Content, % (PL)

23.02 42.1795

Liquid Limit:	35.3
Plastic Limit: Line I	23.0
Plasticity Index: Pl = LL - PL	12.3







Tested By: JH Checked By: PH



# Determination of Atterberg Limits ASTM D 4318, CTM 204

Project Name:	HSR	Boring No	o.: S0069AR			Project No.: 23502-ZS9	
Sample No:	SS15	Depth:	61-61.5'	Date:	12/4/13	Tested By: R.L.	
Soil Classification:	ML			RETES	T		

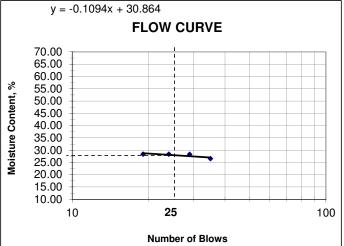
	PLASTIC LIMIT				LIQUID LIMIT			
A Tes No.	1	2	3	No. of Blows	35	19	29	24
B Tare No.	1	2	3		1	2	3	4
C Mass of Pan + Dry Soil, g	22.30	21.80	28.99		27.85	34.33	28.01	26.24
D Mass of Pan + Wet Soil, g	22.60	22.00	29.15		29.75	35.93	30.11	27.55
E Mass of Pan, g	20.90	20.90	28.30		20.70	28.70	20.60	21.63
F Mass of Water, g	0.30	0.20	0.16	0.00	1.90	1.60	2.10	1.31
G Mass of Dry Soil, g	1.40	0.90	0.69		7.15	5.63	7.41	4.61
H Moisture Content, %	21.43	22.22	23.19		26.57	28.42	28.34	28.42

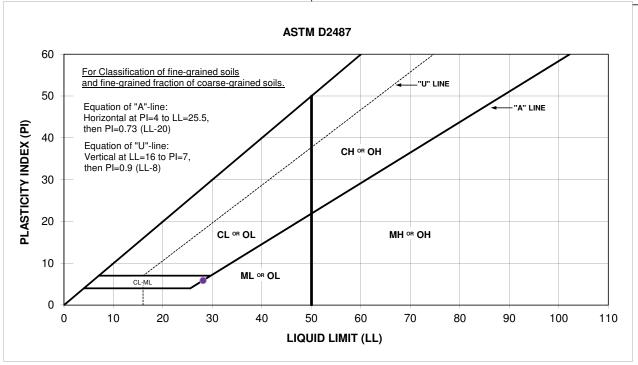
I Average Moisture Content, % (PL)

42.1795

22.28

Liquid Limit:	28.1
Plastic Limit: Line I	22.3
Plasticity Index: Pl = LL - PL	5.8







# Determination of Atterberg Limits ASTM D 4318, CTM 204

Project Name:	HSR	Boring No	o.: S0069AR			Project No.: 23502-ZS9	
Sample No:	SS15	Depth:	61-61.5'	Date:	11/20/13	Tested By: R.L.	
Soil Classification:	ML						

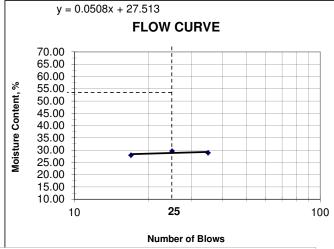
	PLASTIC LIMIT					LIQUIE	LIMIT	
A Tes No.	1	2	3	No. of Blows	35	17	25	
B Tare No.	1	2	3		1	2	3	
C Mass of Pan + Dry Soil, g	30.60	29.70	21.90		29.10	29.40	36.50	
D Mass of Pan + Wet Soil, g	31.20	29.90	22.20		31.50	31.80	38.90	
E Mass of Pan, g	28.40	28.50	20.70		20.80	20.80	28.40	
F Mass of Water, g	0.60	0.20	0.30	0.00	2.40	2.40	2.40	
G Mass of Dry Soil, g	2.20	1.20	1.20		8.30	8.60	8.10	
H Moisture Content, %	27.27	16.67	25.00		28.92	27.91	29.63	

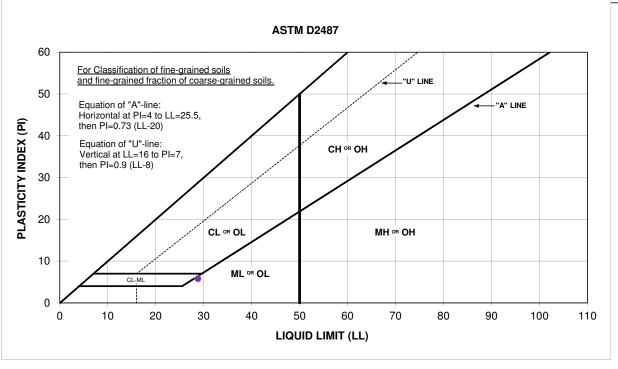
I Average Moisture Content, % (PL)

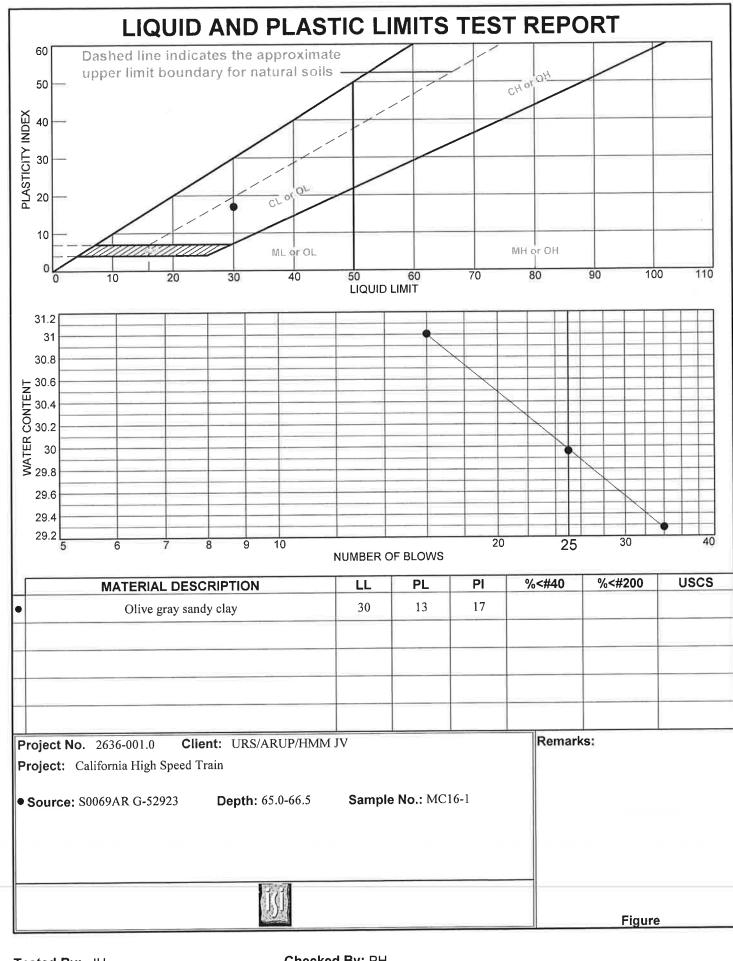
42.1795

22.98

Liquid Limit:	28.8
Plastic Limit: Line I	23.0
Plasticity Index: Pl = LL - PL	5.8







Tested By: JH Checked By: PH



# Determination of Atterberg Limits ASTM D 4318, CTM 204

Project Name:	HSR	Boring No	o.: S0069AR			Project No.: 23502-ZS9	
Sample No:	SS17	Depth:	71-71.5'	Date:	11/19/13	Tested By: R.L.	
Soil Classification:	CL						

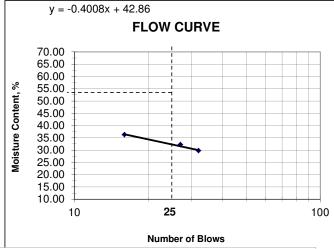
		PLASTIC LIMIT			LIQUID LIMIT				
Tes No.	1	2	3	No. of Blows	16	27	32		
Tare No.	1	2	3		1	2	3		
Mass of Pan + Dry Soil, g	21.20	29.40	29.70		26.20	27.10	27.40		
Mass of Pan + Wet Soil, g	21.30	29.60	30.00		28.20	29.20	29.40		
Mass of Pan, g	20.60	28.50	28.50		20.70	20.60	20.70		
Mass of Water, g	0.10	0.20	0.30	0.00	2.00	2.10	2.00		
Mass of Dry Soil, g	0.60	0.90	1.20		5.50	6.50	6.70		
Moisture Content, %	16.67	22.22	25.00		36.36	32.31	29.85		
	Tare No.  Mass of Pan + Dry Soil, g  Mass of Pan + Wet Soil, g  Mass of Pan, g  Mass of Water, g  Mass of Dry Soil, g	Tes No. 1  Tare No. 1  Mass of Pan + Dry Soil, g 21.20  Mass of Pan + Wet Soil, g 21.30  Mass of Pan, g 20.60  Mass of Water, g 0.10  Mass of Dry Soil, g 0.60	Tes No.         1         2           Tare No.         1         2           Mass of Pan + Dry Soil, g         21.20         29.40           Mass of Pan + Wet Soil, g         21.30         29.60           Mass of Pan, g         20.60         28.50           Mass of Water, g         0.10         0.20           Mass of Dry Soil, g         0.60         0.90	Tare No.         1         2         3           Mass of Pan + Dry Soil, g         21.20         29.40         29.70           Mass of Pan + Wet Soil, g         21.30         29.60         30.00           Mass of Pan, g         20.60         28.50         28.50           Mass of Water, g         0.10         0.20         0.30           Mass of Dry Soil, g         0.60         0.90         1.20	Tes No.         1         2         3         No. of Blows           Tare No.         1         2         3           Mass of Pan + Dry Soil, g         21.20         29.40         29.70           Mass of Pan + Wet Soil, g         21.30         29.60         30.00           Mass of Pan, g         20.60         28.50         28.50           Mass of Water, g         0.10         0.20         0.30         0.00           Mass of Dry Soil, g         0.60         0.90         1.20	Tes No.         1         2         3         No. of Blows         16           Tare No.         1         2         3         1           Mass of Pan + Dry Soil, g         21.20         29.40         29.70         26.20           Mass of Pan + Wet Soil, g         21.30         29.60         30.00         28.20           Mass of Pan, g         20.60         28.50         28.50         20.70           Mass of Water, g         0.10         0.20         0.30         0.00         2.00           Mass of Dry Soil, g         0.60         0.90         1.20         5.50	Tes No.         1         2         3         No. of Blows         16         27           Tare No.         1         2         3         1         2           Mass of Pan + Dry Soil, g         21.20         29.40         29.70         26.20         27.10           Mass of Pan + Wet Soil, g         21.30         29.60         30.00         28.20         29.20           Mass of Pan, g         20.60         28.50         28.50         20.70         20.60           Mass of Water, g         0.10         0.20         0.30         0.00         2.00         2.10           Mass of Dry Soil, g         0.60         0.90         1.20         5.50         6.50	Tes No.         1         2         3         No. of Blows         16         27         32           Tare No.         1         2         3         1         2         3           Mass of Pan + Dry Soil, g         21.20         29.40         29.70         26.20         27.10         27.40           Mass of Pan + Wet Soil, g         21.30         29.60         30.00         28.20         29.20         29.40           Mass of Pan, g         20.60         28.50         20.70         20.60         20.70           Mass of Water, g         0.10         0.20         0.30         0.00         2.00         2.10         2.00           Mass of Dry Soil, g         0.60         0.90         1.20         5.50         6.50         6.70	

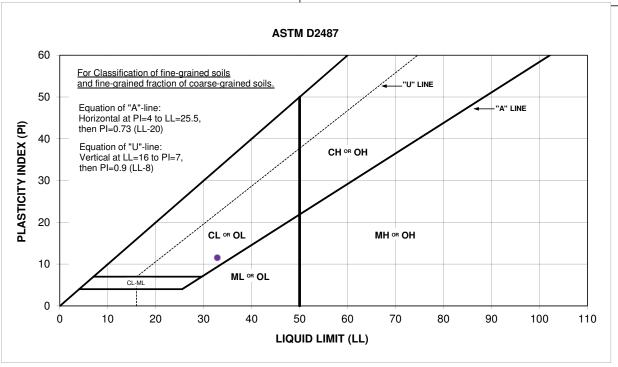
I Average Moisture Content, % (PL)

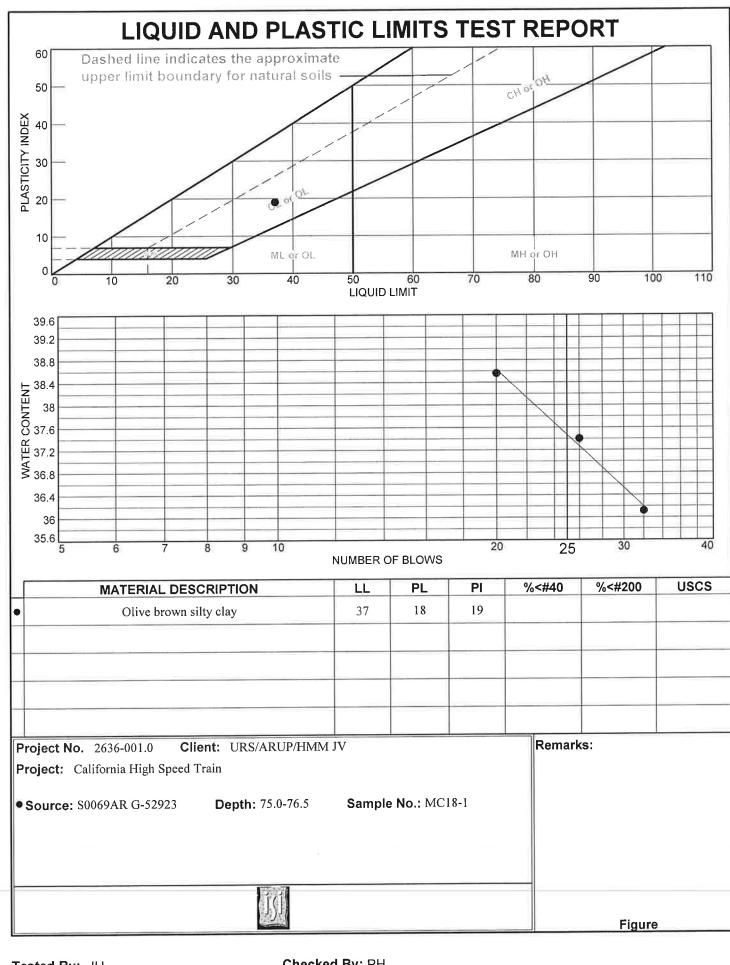
42.1795

21.30

Liquid Limit:	32.8
Plastic Limit: Line I	21.3
Plasticity Index: Pl = LL - PL	11.5







Tested By: JH Checked By: PH



# **ASTM D2850**

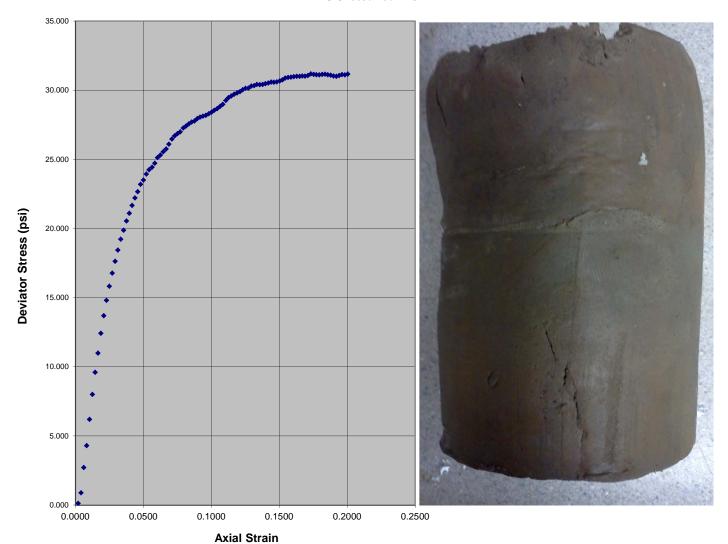
PROJECT	CA HST	
BORING # <b>S0069</b> /	AR; MC6-1 Depth (ft)	26
DESCRIPTION	(CL) Sandy Clay	

TES#	23502-ZS9	
Test Date	11/8/2013	
Tested By	D. Carruba	

### **Sample and Test Parameters**

Wt. Specimen Wet + Tare (gm)	794	Water Content %	19.0	Diameter, D <sub>0</sub> , (in)	2.43
Wt. Specimen Dry + Tare (gm)	667.2	Wt. Tare (gm)	0	Area, A <sub>0</sub> , (in <sup>2</sup> )	4.64
Wt. Water (gm)	126.8	Unit Wt. Wet (pcf)	133.9	Height, $H_0$ , (in)	4.87
Wt. Speciment Dry (gm)	667.2	Unit Wt. Dry (pcf)	112.5	Volume, V <sub>0</sub> , (in <sup>3</sup> )	22.59
Rate, in/min	0.05	Rate, %/min	1.00	Saturation, %*	103.2
Cell Pressure, psi	30	Axial Strain, %	20.66%	Deviator Stress, psi	31.26

\*S.G. assumed 2.70





# **ASTM D2850**

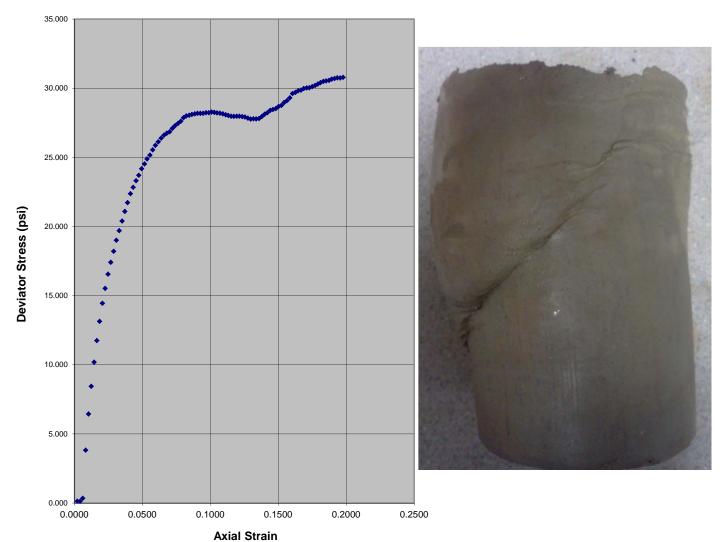
PROJECT	CA HST	
BORING # <b>S0069</b> /	AR; MC9-1 Depth (ft)	36
DESCRIPTION	(ML) Sandy Silt	

TES #	23502-ZS9	
Test Date	11/8/2013	
Tested By	D. Carruba	

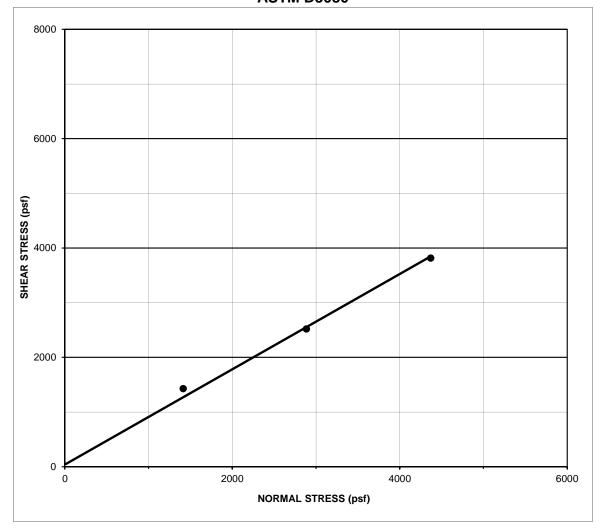
### **Sample and Test Parameters**

Wt. Specimen Wet + Tare (gm)	785.6	Water Content %	20.3	Diameter, D <sub>0</sub> , (in)	2.42
Wt. Specimen Dry + Tare (gm)	652.8	Wt. Tare (gm)	0	Area, A <sub>0</sub> , (in <sup>2</sup> )	4.60
Wt. Water (gm)	132.8	Unit Wt. Wet (pcf)	131.7	Height, $H_0$ , (in)	4.94
Wt. Speciment Dry (gm)	652.8	Unit Wt. Dry (pcf)	109.4	Volume, V <sub>0</sub> , (in <sup>3</sup> )	22.72
Rate, in/min	0.05	Rate, %/min	1.00	Saturation, %*	101.8
Cell Pressure, psi	40	Axial Strain, %	20.39%	Deviator Stress, psi	30.86

\*S.G. assumed 2.70





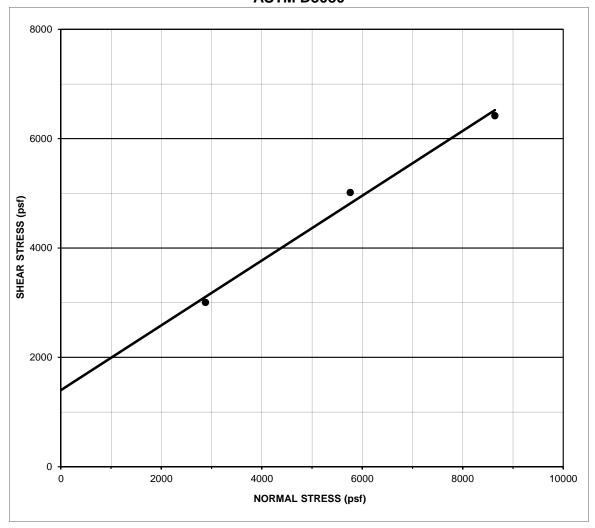


PROJECT:	HSR
TES NO.:	23502-ZS9
SAMPLE DATE.:	9/13/2013
BORING NO.:	S0069AR
SAMPLE NO.:	MC04-1 Depth(16-16.5")
DESCRIPTION:	Fine Sand (SP)

Cohesive Pressure, psf	250	
Internal Friction Angle	39	

SPECIMEN	Α	В	С	D	E
DRY DENSITY (pcf)	94.9	94.9	94.9		
INITIAL WATER CONTENT (%)	4.8	04.8	4.8		
FINAL WATER CONTENT (%)	27.00	27.90	26.80		
NORMAL STRESS (psf)	1415	2885	4371		
NORMAL STRESS (psi)	10	20	30		
MAXIMUM SHEAR (psf)	1428	2520	3816		





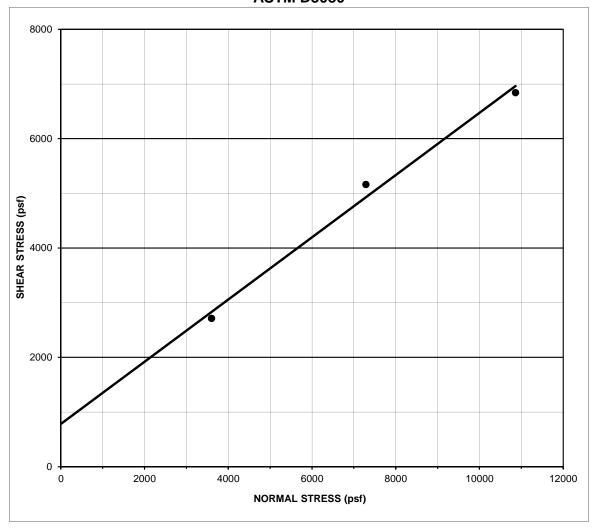
PROJECT:	HSR
TES NO.:	23502-ZS9
SAMPLE DATE.:	10/25/2013
BORING NO.:	S0069AR
SAMPLE NO.:	U08* Depth(33.5-34')
DESCRIPTION:	Fine Sand (SP)

Cohesive Pressure, psf	1400	
Internal Friction Angle	31	

<sup>\*</sup>Rings pressed into shelby tube

SPECIMEN	Α	В	С	D	E
DRY DENSITY (pcf)	109.8	109.8	109.8		
INITIAL WATER CONTENT (%)	17.3	17.3	17.3		
FINAL WATER CONTENT (%)	20.80	22.20	21.00		
NORMAL STRESS (psf)	2880	5760	8640		
NORMAL STRESS (psi)	20	40	60		
MAXIMUM SHEAR (psf)	3005	5015	6421		



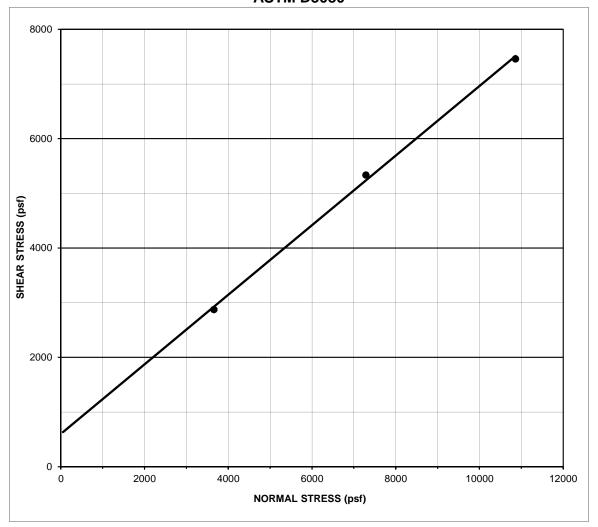


PROJECT:	HSR
TES NO.:	23502-ZS9
SAMPLE DATE.:	10/25/2013
BORING NO.:	S0069AR
SAMPLE NO.:	MC12-1 Depth(46-46.5')
DESCRIPTION:	Sandy Clay (SC)

Cohesive Pressure, psf	780
Internal Friction Angle	30

SPECIMEN	Α	В	С	D	E
DRY DENSITY (pcf)	94.9	94.9	94.9		
INITIAL WATER CONTENT (%)	4.8	04.8	4.8		
FINAL WATER CONTENT (%)	27.00	27.90	26.80		
NORMAL STRESS (psf)	3600	7287	10863		
NORMAL STRESS (psi)	25	50	75		
MAXIMUM SHEAR (psf)	2712	5163	6841		





PROJECT:	HSR
TES NO.:	23502-ZS9
SAMPLE DATE.:	10/25/2013
BORING NO.:	S0069AR
SAMPLE NO.:	MC14 Depth(56-56.5')
DESCRIPTION:	Silty Sand (SM)

Cohesive Pressure, psf	600
Internal Friction Angle	32

SPECIMEN	Α	В	С	D	E
DRY DENSITY (pcf)	117.7	117.7	117.7		
INITIAL WATER CONTENT (%)	14.4	14.4	14.4		
FINAL WATER CONTENT (%)	18.60	17.10	20.30		
NORMAL STRESS (psf)	3656	7287	10863		
NORMAL STRESS (psi)	25	50	75		
MAXIMUM SHEAR (psf)	2874	5335	7460		



# R - VALUE TEST ASTM D - 2844 / CAL 301

Project Number : 23502-ZS9

Project Name : CA HSR FRE\_BAK

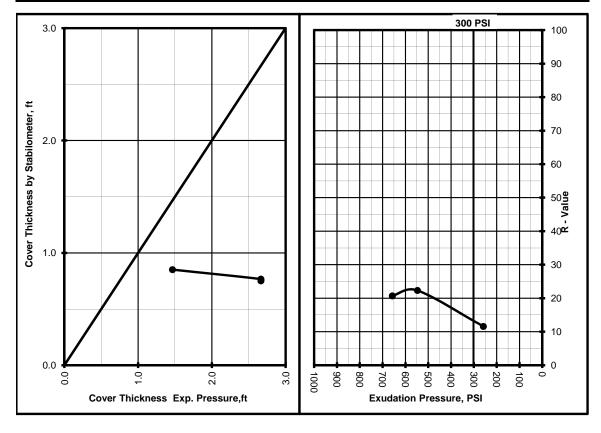
Date : 10/10/13

Sample Location/Curve Number : Boring S0069AR,B-1 @ 0-5'

Soil Classification : CL - Untreated

TEST	Α	В	С
Percent Moisture @ Compaction, %	15.9	17.1	18.9
Dry Density, lbm/cu.ft.	114.5	112.3	108.9
Exudation Pressure, psi	657	547	258
Expansion Pressure, (Dial Reading)	0.008	0.008	0.0044
Expansion Pressure, psf	0.03464	0.03464	0.019052
Resistance Value R	21	22	12

R Value by Expansion Pressure (TI =): 5	(6)
R Value at 300 PSI Exudation Pressure	13





# R - VALUE TEST ASTM D - 2844 / CAL 301

Project Number : 23502-ZS9

Project Name : CA HSR FRE\_BAK

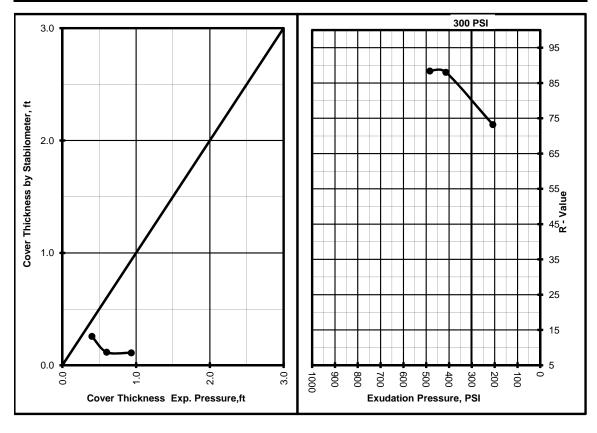
Date : 10/7/13

Sample Location/Curve Number : Boring S0069AR,B-1 @ 0-5'

Soil Classification : CL- Treated w/ Quicklime Plus @ 4%

TEST	А	В	С
Percent Moisture @ Compaction, %	14.5	14.1	15.5
Dry Density, lbm/cu.ft.	114.3	114.1	113.4
Exudation Pressure, psi	414	484	208
Expansion Pressure, (Dial Reading)	0.0018	0.0028	0.0012
Expansion Pressure, psf	0.007794	0.012124	0.005196
Resistance Value R	88	88	73

R Value by Expansion Pressure (TI =): 5	(69)
R Value at 300 PSI Exudation Pressure	80





# California Bearing Ratio ASTM D - 1883

Project Number : 23502-ZS9

Project Name : CA HSR FRE\_BAK

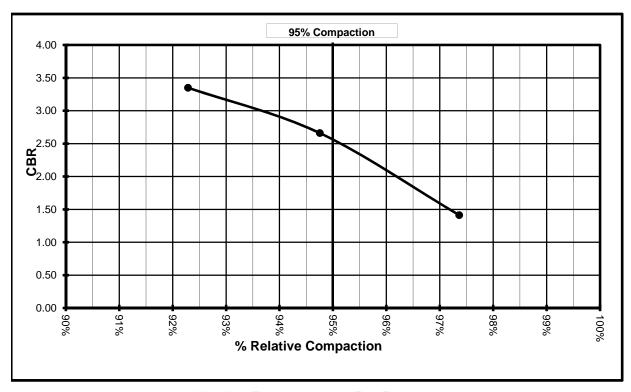
Date : 11/4/13 Sample Location/Curve Number : S0069AR Sample Location/Curve Number : B01 0'-5'

Soil Classification : (CL) Sandy Clay Gray-Brown

Method of Compaction : ASTM D 1557

TEST	Α	В	С
Max Dry Density @ Optimum, lb/cu.ft.	120.0	120.0	120.0
Percent Moisture as Compacted, %	10.6%	10.3%	10.4%
Dry Density, lb/cu.ft.	116.8	113.7	110.7
Percent Relative Compaction. %	97.4%	94.8%	92.3%
Surcharge Weight, lb	10	10	10
Percent Moisture @ Testing %	11.4%	11.5%	11.5%
Penetration Depth Check, in	0.50	0.49	0.48
Stress @ 0.1 / 0.2 " Penetration, psi	14	23	18
Swell During Saturation, %	0.13%	0.13%	0.13%
CBR Value	1.41	2.66	3.35







# ASTM D - 1557

**Project Number** : 23502-ZS9

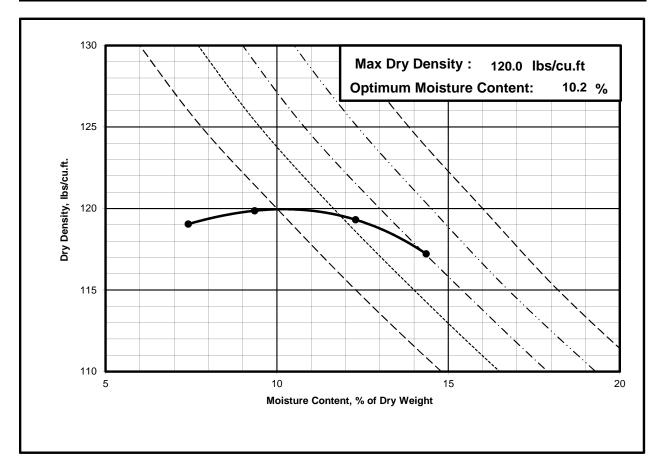
: CA HSR FRE\_BAK **Project Name** 

Date : 11/4/2013 Sample location : S0069AR Sample/Curve Number : B01 0'-5'

Soil Classification : (CL) Sandy Clay Gray-Brown

Test Method : 1557C

	1	2	3	4
Weight of Moist Specimen & Mold, gm	7416.8	7414.8	7315.6	7206.7
Weight of Compaction Mold, gm	2856.6	2856.6	2856.6	2856.6
Weight of Moist Specimen, gm	4560.2	4558.2	4459.0	4350.1
Volume of mold, cu. ft.	0.0750	0.0750	0.0750	0.0750
Wet Density, lbs/cu.ft.	134.0	134.0	131.1	127.9
Weight of Wet (Moisture) Sample, gm	200.0	200.0	200.0	200.0
Weight of Dry (Moisture)Sample, gm	174.9	178.1	182.9	186.2
Moisture Content, %	14.4	12.3	9.3	7.4
Dry Density, lbs/cu.ft.	117.2	119.3	119.9	119.0





# **Expansion Index Test** UBC Standard 29-2 / ASTM D4829

Project: HSR S0069AR			Tech	nician: KF		
			- -	Date: 11/12/2013		
TES#: <u>23502-ZS9</u>			_	mple No.: B01		
Lab #:			_ Re	Remarks: <u>CL</u>		
Water Added (ml)	0					
. ,				Time	Dial Reading	
Wt. Of Soil + Mold (g)	770.7			11/12/13 12:15	0.0000	
Wt. of Mold (g)	364.7			11/12/13 17:00	0.0211	
vvt. or word (g)	304.7			11/13/13 9:15	0.0764	
Wt. of Soil (g)	406.0			11/13/13 11:15	0.0812	
o. o. (9)				11/13/13 12:15	0.0845	
Wt. of Soil (lb)	0.895					
Wet Density (pcf)	122.4					
Moisture Sample, wet (g)	22.0					
Moisture Sample, dry (g)	20.0					
Moisture Content (%)	10.2					
/HG A36	111.1			FINAL	0.0845	
				LINAL	0.0043	
Specific Gravity	2.7			Expansion me	as. = 0.0845	
Degree of Saturation (%)	53.4			Exp. Index me		
Degree of Saturation (76)	33.4			Exp. Index 50	= 87.6	
				Expansion Po	otential Table	
			1	· ·	Potential Expansion	
EXPANSION IN	DEX =	87.6		0-20	Very Low	
				21-40	Low	
				41-80	Medium	
				81-120	High	
				>120	Very High	